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U. S. DEPARTMENT OF AGRICULTURE.

FARMERS' BULLETIN No. 12.

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NOSTRUMS

FOR

INCREASING THE YIELD OF BUTTER.

BY

HARVEY W. WILEY,
CHEMIST OF THE U. S. DEPARTMENT OF AGRICULTURE.

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FARMERS' BULLETINS.

The bulletins of this series may be obtained by applying to the Secretary of Agriculture, Washington, D. C. The following have been previously issued:

Farmers' Bulletin No. 1. The What and Why of Agricultural Experiment Stations. (A brief explanation of the object, origin, and development of the stations, their work in Europe and in the United States, and the operations of the Office of Experiment Stations of the Department of Agriculture.) Prepared by the Office of Experiment Stations. Pp. 16. Issued June, 1889.

Farmers' Bulletin No. 2. The Work of the Agricultural Experiment Stations. (Illustrations of station work in the following lines: Better cows for the dairy; fibrin in milk; bacteria in milk, cream, and butter; silos and silage; alfalfa; and field experiments with fertilizers.) Prepared by the Office of Experiment Stations. Pp. 16. Issued June, 1889.

Farmers' Bulletin No. 3. The Culture of the Sugar Beet. (Treats of the climatic conditions, soil, fertilizers, and cultivation required by the sugar beet, cost of growing, time to harvest, and method of siloing; describes briefly the process of beet-sugar manufacture, and gives statistics of sugar production and consumption.) By H. W. Wiley, chemist of the Department of Agriculture. Pp. 24. Issued March, 1891.

Farmers' Bulletin No. 4. Fungous Diseases of the Grape and their Treatment. (Describes downy mildew, powdery mildew, black rot, and anthracnose of grapes, and gives instructions for their treatment and estimated cost of remedies.) By B. T. Galloway, chief of the Division of Vegetable Pathology. Pp. 12. Issued March, 1891.

Farmers' Bulletin No. 5. Treatment of Smuts of Oats and Wheat. (Describes the smuts of wheat, oats, and barley, the damage they cause, and the various methods of treatment which have been found useful for their prevention.) Prepared by the Division of Vegetable Pathology. Pp. 8. Issued February, 1892.

Farmers' Bulletin No. 6. Tobacco: Instructions for its Cultivation and Curing. Prepared by John M. Estes, special agent. Pp. 8. Issued February, 1892.

Farmers' Bulletin No. 7. Spraying Fruits for Insect Pests and Fungous Diseases, with a Special Consideration of the Subject in its Relation to the Public Health. Prepared by the Divisions of Entomology and Vegetable Pathology. Pp. 20. Issued April, 1892.

Farmers' Bulletin No. 8. Results of Experiments with Inoculation for the Prevention of Hog Cholera. By D. E. Salmon, chief of the Bureau of Animal Industry. Pp. 40. Issued May, 1892.

Farmers' Bulletin No. 9. Milk Fermentations and their Relations to Dairying. Prepared in the Office of Experiment Stations. Pp. 24. Issued July, 1892.

Farmers' Bulletin No. 10. The Russian Thistle and other Troublesome Weeds in the Wheat Region of Minnesota and North and South Dakota. Pp. 16. Issued April, 1893.

Farmers' Bulletin No. 11. The Rape Plant: Its History, Culture, and Uses. By Thomas Shaw. Pp. 20. 1893.

NOSTRUMS FOR INCREASING THE YIELD OF BUTTER.

LETTER OF TRANSMITTAL.

U. S. DEPARTMENT OF AGRICULTURE,
DIVISION OF CHEMISTRY,
Washington, D. C., May 11, 1893.

SIR: I beg to submit for your inspection the manuscript of Farmers' Bulletin No. 12, on nostrums for increasing the yield of butter.

Respectfully,

H. W. WILEY, *Chemist.*

Hon. J. STERLING MORTON,
Secretary of Agriculture.

GILT-EDGE BUTTER COMPOUND.

For several years the farmers of the country have been tempted to invest in various secret nostrums which it was claimed would increase the yield of butter. In the annual report of the Department for 1891 an analysis of a sample of this kind and a description of its effect in increasing the apparent yield of butter were given. The report was as follows:

Mr. H. J. Fish, superintendent of the Producers' Dairy Company, 324 B street southwest, Washington, D. C., brought to me a sample of genuine butter, together with a sample of artificial butter, prepared by taking equal parts, by weight, of the genuine butter and milk and churning them together with the addition of a small quantity of the substance known as "gilt-edge butter compound," from the Planet Manufacturing Company, of Wichita, Kans. The directions for the use of this compound are to take a pint of fresh, unskimmed milk and as much of the compound as you can heap on a silver 10-cent piece, and thoroughly mix the compound and milk together in the churn with as much salt as is necessary to salt 1 pound of butter. Add to this 1 pound of soft butter, and churn until the whole mass has come to butter, when you will have 2 pounds of butter and no milk. It is directed that the genuine butter should not be melted, but made very soft and pliable, so that the churn dasher will easily go through it. The milk should be warmed to the temperature at which it is taken from the cow. The churn should always be scalded or warmed sufficiently to prevent chilling the milk, plenty of salt added, and butter color, if used, before churning. It is particularly enjoined that the butter should not be worked, but should be made into rolls, and put into jars, and set away in a cool place to harden.

The sample of genuine dairy butter which was furnished with the compound was found to contain—

	Per cent.
Water	15.92
Butter fat	80.53
Ash38
Curd and undetermined	3.17

This represents a fair sample of butter, with the exception that the water and curd are a little higher than the average. In the premium butters obtained at the Chicago Dairy Show in 1889, the percentage of moisture varied in ten samples from 8.69 per cent to 11.86 per cent.

The artificial butter prepared from the above by the Producers' Dairy Company was subjected to analysis, and the following numbers were obtained:

	Per cent.
Water	49.55
Butter fat	45.45
Ash	1.34
Curd and undetermined	3.66

It would appear from the above that the artificial butter had been made by churning the pure butter with a very dilute milk.

There was no doubt at all that the gilt-edge butter compound would do what was claimed for it, inasmuch as Mr. Fish had made the butter himself according to the directions.

The compound was also submitted to a practical test in the laboratory of this Department, and it was found that with 1 pound of butter, 1 pint of milk, and about 1 gram of the butter compound, 2 pounds of material could easily be made, which resembled very closely a first-class article of butter, except that it was considerably softer.

It was at once suspected that the compound contained some emulsifying substance, either of a mineral nature or some organic ferment. On subjecting the butter compound to analysis it was found to contain 70.48 per cent of anhydrous sodium sulphate and 29.52 per cent of organic matter. This organic matter responded perfectly to the test for pepsin, and part of it was undoubtedly pepsin; whether a pure pepsin or a crude form was not determined. Having established the fact that this was pepsin, experiments were made with pepsin and other digestive ferments, viz, pancreatin and trypsin. These bodies act as pepsin, and produce an emulsion which enables butter to incorporate an equal weight of milk in its substance without materially altering its appearance. The experiments were also tried with rennet, and it was found to act in the same way; whence it may be concluded that all the digestive ferments, when beaten up with milk and butter in the manner indicated, will produce an emulsion apparently causing the milk to entirely disappear.

The gilt-edge butter compound is colored pink, with some organic coloring matter, in order to obscure its real nature. The anhydrous sodium sulphate seems to be added simply as a carrying material, and it is not supposed to produce any active effect in the emulsifying process; in fact, pepsin, pancreatin, trypsin, and rennet used without anhydrous sodium sulphate produce exactly the same emulsifying effect as the gilt-edge butter compound.

By this simple device the unprincipled dealer could easily impose upon his customers, furnishing them with an article of butter containing only half of the portion of that substance without greatly diminishing its price. The keeping properties, of course, of the emulsified butter would not be very great, but for rapid home consumption this would not be noticed.

BLACK PEPSIN.

During the year 1892 the Department received many communications relating to the methods of increasing the yield of butter—nearly all the correspondents speaking of the agent employed as “black pepsin.” Evidently the success of those engaged in the “gilt-edge butter compound” business was such as to excite the envy and emulation of other unscrupulous persons. Advertisements appeared in agricultural and other newspapers, and many unwary and uninformed persons became victims of the fraud. The continued success of the fraudulent compound was of such magnitude as to warrant another notice of it in the Annual Report of the Department for 1892. This report contains the following information:

In the Report for 1891 was published a description of a preparation designed to increase the yield of butter. This preparation was sold at a high price and had the power of causing the incorporation of the casein, milk, sugar, and other constituents of the milk with the butter fat. This was effected by producing a kind of an emulsion by which these bodies were held in suspension. The apparent result of the process was to double the yield of butter. It was pointed out at the time that this substance was pepsin and that the apparent yield was in reality a delusion, as, of course, there is no method by which the actual content of butter fat in milk can be increased after the milk leaves the cow.

During the present year the Department has received numerous inquiries concerning the substance known and sold as black pepsin, which is used for the purpose described above. In reply to these inquiries the information has been of a uniform character, viz, that this substance has essentially the properties ascribed to it, but that its use in all cases must be regarded as a fraud and hence avoided.

One sample of the black pepsin above referred to has been examined by the Department and found to consist essentially of a mixture of crude pepsin with sugar. It is hoped that farmers will not be deceived by the claims of persons desiring to sell this compound, inasmuch as butter made in this way will soon spoil and is practically not butter, but simply an incorporation of butter with about an equal weight of other substances. The sale of such butter is also practically an adulteration of a food product and should be prohibited by law.

In spite of the warnings given in the above reports of the Department and by the dairy commissions and agricultural experiment stations of many of the States, a brisk and apparently increasing trade has been kept up in these substances greatly to the detriment of those innocently purchasing the nostrums and to the consumer of the product—a product not butter, but a mixture of butter fat with water, casein, milk, sugar, and other constituents of milk. Such a product soon suffers a separation of its constituents, and is exposed to the decay of its nitrogenous components and a speedy rancidity of its fatty ingredients. The magnitude of these fraudulent practices and the extent to which they have spread throughout the country have been revealed in quite a startling manner by replies to a circular asking for information on this subject sent to boards of health, members of dairy and pharmaceutical associations, and city officers throughout the country.

The numerous replies to this circular which have been received have been referred to Mr. A. J. Wedderburn, special agent of the Department for the investigation of the general aspects of food adulteration. As a result of his study of these replies Mr. Wedderburn has prepared the following preliminary report:

REPORT OF A. J. WEDDERBURN ON BLACK PEPSIN IN BUTTER-MAKING.

The investigation recently undertaken of the extent and character of food and drug adulteration has revealed two new and extensive frauds, and feeling that I have secured evidence enough from reliable sources to justify the publication of the results of the inquiry, I submit the accompanying advance report and take the liberty of suggesting that the same be at once given to the public to offset as far as possible the ill effects of the proposed expenditure of \$125,000 in advertising the articles prepared by the firm offering these goods for consumption by the people.

Circulars issued by the Division of Chemistry of the U. S. Department of Agriculture, April 20, making inquiries as to the "extent and character of food and drug adulteration," have already brought replies from nearly every section of the country, many of which give trustworthy information concerning the various adulterations practiced and evincing a strong interest in the subject on the part of the writers.

The query as to what was known about "black pepsin in (so-called) butter-making" has brought forth more replies than any other, and the information obtained is so reliable in its character and of such importance that it is deemed proper to present without delay the following statement:

(1) Of over 2,500 letters received from all parts of the United States only two indorse the use of black pepsin.

(2) While many of the replies state that nothing is known of the article, numerous correspondents say they have had inquiries for it. A large number have it in stock and are selling it. A majority unite in pronouncing it a fraud, and one writer says he has written the manufacturer that if any more of his printed matter is sent to him he will forward it to the postal authorities to ascertain whether the sender is not liable for prosecution for using the mails for fraudulent purposes.

A reputable chemist sends an analysis of the butter made with this solidifying adjunct, and it shows only 63 per cent of butter fat. Butter should not contain less than 85 per cent.

The advertisement above alluded to is printed on a postal card, and states that \$125,000 will be spent this season advertising black pepsin and two other articles, one of which is a preservative powder for fruits and vegetables, and, as the correspondent states, nothing more or less than salicylic acid, an article which in unskilled hands is most dangerous to health and life. The black pepsin is retailed at \$2.50 a box of 2 ounces and wholesaled at \$2. The preservative powder is sold at retail for \$1.25 a box and at wholesale for \$10 per dozen. For obvious reasons the name and address of the vender are withheld.

An analysis of the so-called "black pepsin," made for the Evening News, Detroit, Mich., and published in that paper April 1, 1893, shows the following result:

	Per cent.
Salt	83
Annatto	15
Rennet and organic matter	2

The value of the 2-ounce box sold at retail for \$2.50 is about 3 cents.

Extensive advertising is undoubtedly creating a large inquiry for these products, though their sale and use are fraudulent. The milk solids are curdled and the sugar

and casein "turned to butter," as the advertiser expresses it. The use of black pepsin certainly violates the spirit if not the letter of the oleomargarine law, and dairymen who insist that oleomargarine and other imitations of butter shall be properly branded of necessity must oppose the use of any chemical that certainly perpetrates as great a fraud on honest butter as any other imitation.

There are several other preparations sold in this country and Canada which have not yet been fully investigated. Believing that these products are being advertised by the press, sold and used from ignorance of their true character and value, it is deemed proper to submit this statement in advance of the regular bulletin, which is now in process of preparation and can not be completed for some months to come.

The letters upon which this statement is based have been received from the following States: Alabama, California, Delaware, Florida, Georgia, Indiana, Illinois, Iowa, Kansas, Kentucky, Louisiana, Maryland, Massachusetts, Missouri, Michigan, Nebraska, New Jersey, New York, Ohio, Oregon, Pennsylvania, Rhode Island, Utah, Vermont, Virginia, Washington, and Wisconsin.

It seems strange that such a palpable fraud should continue to be practiced after its repeated exposure by this Department and by leading agricultural papers.

METHODS OF ADVERTISING BLACK PEPSIN.

In respect of the method of advertising black pepsin, the direct way of sending postal cards and circulars to the farmers seems to be the one chiefly followed.

A vigorous attempt has also been made to interest the druggists of the country in the sale of this article, as well as others of similar character. Following is a copy of a postal card which has presumably been sent to the drug trade in general. It was addressed to Otto Bauchfuss & Co., Cincinnati, Ohio. The card was mailed at New Concord, Ohio, April, 1893:

PRICES FOR 1893.

We will expend in 1893 \$125,000 advertising these three specialties. Place these on your list, as you will certainly receive orders.

Black pepsin.—A powder prepared expressly for increasing the yield of butter and cheese. Each box will make 500 pounds of butter. Retail \$2.50 per box, \$24 per dozen. Ten per cent off to wholesale and jobbing trade. Three per cent off for cash in ten days.

Electrofied silver.—A metal for plating articles usually plated with silver. Can be used without any battery and requires no experience to apply it. You can plate a dozen spoons in fifteen minutes, and guarantee them for ten years. Each package will do \$350 worth of plating. Retail price, \$7.50 per package, \$75 per dozen. Ten per cent off to wholesale and jobbing trade. Three per cent off for cash in ten days.

Compound extract of salyx.—A powder for preserving fruits and vegetables. Each box preserves 25 gallons of fruit. Retail at \$1.25 per box, \$10 per dozen. Ten per cent off to wholesale and jobbing trade. Three off for cash in ten days.

U. S. SALYX Co.,
New Concord, Ohio, Sole Proprietors.

The electrofied silver mentioned in the above card is without doubt some mercurial amalgam, and is a striking example of how freely in this country the vendor of poisonous articles is allowed to bring them to the notice of the trade. "The compound extract of salyx" is the gorgeous title under which the modest salicylic acid is made to masquerade.

The rigid enforcement of the postal laws prohibiting the use of the mails for fraudulent purposes would exclude these postal cards from circulation. The circular and postal-card advertisements are nearly the sole resources of the Salyx Company, since few newspapers will admit to their columns the advertisements of such barefaced swindlers.

WHAT IS BLACK PEPSIN?

So complete is the fraudulent nature of this material that it has been doubted by some eminent chemists whether the supposed active material in it is of any value whatever. This phase of the case is thoroughly set forth in the following extract from a letter received from Prof. H. A. Weber, of Columbus, Ohio:

* * * Black pepsin is made and sold by a man named Bane, under the style of "U. S. Salyx Co., New Concord, Ohio." According to Prof. Kedzie, it consists of salt and coloring matter. It is sold for making 2 pounds of butter out of 1 pound of butter and 1 pound of milk. It is also claimed to be patented, and county rights are being sold in this State. But as the assignments which have come to my notice do not even contain the number of a patent, it is reasonable to assume that this claim is not true. Many people have been induced to buy the fraud, in hope of making money out of it. Numerous inquiries have come to the office of our dairy and food commission as to whether this butter could be sold under our laws as unadulterated. But as it is one-half butter and one-half milk, it could of course not be allowed to be sold.

It is true that a pound of soft butter and a pound of milk slightly warmed, churned, or shaken together will unite to a solid mass weighing 2 pounds. But the black pepsin plays no part in this operation, as it can be accomplished just as well without as with it.

About three years ago a party in Marion, Ohio, sold a preparation of this kind for the same purpose for \$1 a box, containing about an ounce of a powder. He sent the powder through the mail to purchasers all over the country. A postal detective sent me a box for analysis. It consisted of alum, bicarbonate of soda, and turmeric. The circular accompanying the box gave instructions for making butter out of equal parts of butter and milk, and for two pounds it was only necessary to add of the powder what would be held on the point of a penknife. I told the detective that the powder was a fraud, as the same thing could be accomplished without the addition of the powder. The party was arrested, tried before the United States court at Toledo, Ohio, convicted, and sent to the penitentiary for using the mail for fraudulent purposes. This black pepsin is just as great a fraud.

If you wish to make the experiment, put a pound of soft butter into a wide-necked bottle, add a pint of lukewarm milk, and shake for a moment, and you will see how readily the milk and butter will emulsify. * * *

From our correspondents we learn that many other nostrums are in use besides those which we have mentioned in this report and the analyses of which follow. All of these preparations make the same claim for increasing the yield of butter. Among others, one correspondent says that a mixture of alum, pepsin, and yolk of egg has been employed, which with 1 pound of butter and 1 quart of milk will make 2 pounds of richly colored butter.

BUTTER MADE WITH THE COMPOUND.

It is not probable that butter made in any of the ways mentioned or by any of the means employed can secure a permanent hold in the market. Its tendency to separation, decomposition, and rancidity would be so great as to condemn it for general use. Nevertheless such butters are found in our markets, as the following letter from Dr. Henry Leffman, 715 Walnut street, Philadelphia, will show:

I send you by this mail a small sample of butter such as is occasionally sold in this city, principally in the district mostly occupied by very poor people; in fact, the "slum" district. This butter, when first bought, is pale and spongy. The sample has dried somewhat, but when I first got it it contained approximately 40 per cent of water. Several samples were brought in, and I am not sure that the portion I send you is from that which I analyzed, but they are evidently of the same general origin. I do not know how the butter is prepared, but it is sold at about half the price per pound lump that ordinary butter brings. In samples purchased about a year ago I failed to find any fat other than butter fat, but I have not tested the recent samples for this determination. I send the sample to you, because it may be of some interest as one of the adulterations of dairy products, and I will be pleased to learn of safe arrival.

The sample of butter gave on analysis the following data:

	Per cent.
Water	31.93
Fat	67.30
Curd63
Ash (salt).....	.15

The butter fat contained 4.86 per cent volatile acids and gave a Reichert number of 27.62. It was therefore pure butter fat. The remarkable features of this butter are its excessive water content and its extremely low percentage of curd and salt. It appears to have been made originally by emulsifying a fair quality of butter with a large quantity of water. It could not have been emulsified with milk on account of the low content of curd.

A simple test can be easily applied by anyone to distinguish one of these so-called butters from the genuine article. On melting a genuine article of butter the amount of water which will separate on the bottom of the melted mass is very small and should not exceed 12 per cent in volume of the whole material. By placing a little of the suspected butter in an ordinary test tube and melting it at a gentle temperature and comparing the same with a sample of genuine butter, the difference in the amount of the material not butter fat will at once be noticed. In the adulterated article almost half of the whole volume will be a mixture of water, curd, and other materials, while with the genuine article of butter the fat will separate in a clear, limpid mass, and a small amount of water and a little curd only will appear at the bottom. It is not difficult for any person, no matter how unskilled in manipulation, to distinguish the fraudulent from the genuine butter by the test described.

ANALYSES OF BUTTER COMPOUNDS.

An attempt was made to secure samples of all the various nostrums which are sold for the purpose of fraudulent use in butter-making, and a description of the samples which have been received, with the results of the analyses, are given below:

Serial No. 11255.—Purchased of Ott & Nicoud's pharmacy, northwest corner Fifth and Pine streets, Philadelphia, Pa. Small sample, for which 38 cents in stamps were paid. The substance was a brick-red powder, mixed with a white crystalline powder; containing an abundance of the characteristic starch grains and fragments of the seed coat of some leguminous seed, probably the pea or bean. The sample was accompanied by the printed directions for making butter with black pepsin which follow:

"Let the cream or milk stand until sour and thick, as you would for ordinary churning. Then churn at a temperature of 65° to 70° until the butter begins to gather, then stop churning. Now take 4 pounds of butter for each gallon you are churning, and heat it to about 100°; add to the melted butter 1 teaspoonful of black pepsin to each 4 pounds melted butter. (The directions on each box of black pepsin tell how to dissolve it.) Three gallons of cream would require 12 pounds of butter melted and 3 teaspoonfuls of dissolved black pepsin; after you have added the black pepsin to the melted butter, while still warm pour it into the churn and churn until the butter is like thick cream; then draw off the buttermilk, and pour in on the warm butter enough strong brine to cool and harden the butter; make the brine of salt and cold water—the colder the better; churn the butter in this brine a few minutes till it breaks in lumps as butter usually does, then take up, work, and salt to taste. After deducting the weight of the melted butter you should have more than twice the butter you would in the usual way of churning, and it requires much less time to churn. The melted butter causes the black pepsin to assimilate with the cream, and unites in the form of butter all the cheese, sugar, and butter that milk contains. You can use strong butter or butter that is off in color for melting, as the heating and churning in fresh buttermilk will make the strong butter fresh, sweet, and uniform in color. The more milk the cream contains the more butter you can make; so do not skim the cream close, but leave in plenty milk—the more the better. Remember this: Leave in plenty milk—the more the better.

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Serial No. 11257.—A small sample of black pepsin from C. P. Benson, druggist, Charlottesville, Va. The sample consisted of one eighth ounce, and the price paid was 40 cents. It had the same physical and microscopical composition as No. 11255.

Serial No. 11258.—Bought of Edward N. Cole, druggist, Kokomo, Ind. One box of black pepsin, of which the price was \$2.50. The directions for making butter are the same as above. Printed on the box is a statement that "the contents of this box are sufficient for 500 pounds of butter." Examined by the microscope, the sample disclosed black masses of granular matter, which contained soluble starch but no visible unchanged starch grains. It was a mixture of reddish-brown particles of annatto, white crystalline particles, and blackish particles, giving the whole a grayish appearance. It was evidently quite a different compound from the two mentioned above.

Serial No. 11259.—Bought of R. H. Thomas, publisher of Farmers' Friend, Mechanicsburg, Pa. The directions for use were the same as given above. The microscopical and physical appearance of the sample was the same as for No. 11255. Price of box, \$2.50.

Serial No. 11260.—Bought of West & Jenny, Boston, Mass. It contained the same directions as printed above, and resembled in every respect No. 11255.

Serial No. 11263.—Gilt-edge butter compound. Bought of C. W. Smart, druggist, Allegheny, Pa. Mr. Smart writes that "the sample of powder inclosed for examination is being pushed very extensively in this locality at present. I have been asked to handle it; also had calls for it and black pepsin, neither of which I have in stock. The calls for black pepsin come from the farming district out the Pittsburg and Western Railroad." The circular describing its properties and use, which accompanied the sample, is given on page 12, under No. 11665.

On microscopic examination it was found to be a pinkish-colored powder, only partially soluble in water. The coloring matter is insoluble in ether and soluble in water, properties which are directly opposite to those of annatto. The amount of the sample was so small as to render a satisfactory determination of the coloring matter impracticable.

The insoluble matter is composed of wheat or rye starch and granular matter, the nature of which was not determined. The sample did not appear to contain any pepsin or rennet, or organic ferment capable of coagulating milk. The mineral matter which it contained was sodium sulphate, of which the quantity found was 50.18 (anhydrous salt). From the above it is seen that this sample of gilt-edge butter compound is quite different from that which was originally analyzed in the Division of Chemistry.

Serial No. 11264.—Bought of the Standard Drug Company, Cincinnati, Ohio. Price of box, \$2.50. It contained the same directions for use as given above. The sample resembles in every respect No. 11255.

Serial No. 11265.—Sent by N. W. Cady, secretary board of health, Logansport, Ind. He says: "I send you herewith a sample of 'preservaline' for analysis by the chemical department. There is no bill for the stuff, and I will feel amply repaid if you will let me know the results of the examination. The circular which I send with it directs its use in the proportion of 1 to 70, so you may judge of the dangerous results likely to attend the use of such excessive quantities of a substance which is most likely poisonous."

The examination showed that it was a white powder, soluble in water. On heating it fuses to a colorless glass without blackening, showing the absence of any considerable portion of organic matter. It seems to be almost exclusively composed of borax. A sample of "preservaline," which was analyzed for the Evening News, of Flint, Mich., contained: Common salt, 45.30 per cent; borax, 44.18 per cent, and water, 7.80 per cent. It is used largely for preserving meat, and according to Mr. B. Terne it contains, when used for this purpose, rosanilin, intended to give meat preserved with it the red color supposed to be peculiar to that pickled with potassium nitrate. This red color is omitted when the substance is intended to be used for preserving butter or milk.

Serial No. 11267.—The box had been opened and some of the material used. Presented by W. M. Hilleary, lecturer State Grange, Turner, Oreg. The sample was similar to No. 11258 in all of its physical and microscopical characteristics, except that it contained a little more annatto than that sample.

Serial No. 11268.—The sample was purchased from parties furnishing it to creameries at Owosso and Vernon, Mich., who use it in churning over old rancid butter for making fresh creamery butter out of it. It was sent by S. J. Wilson, secretary of the Michigan Dairy Association, Flint, Mich.

It is a white powder, only partly soluble in water. The insoluble portion is composed of wheat or rye starch and some undetermined granular matter. The sample does not have any power of coagulating milk and therefore probably contains no organic ferment. The soluble portion is composed chiefly of sodium sulphate and potassium nitrate. It contained of the latter substance 47.80 per cent. It also contained 11.13 per cent of albuminoid substances. It is essentially a mixture of potassium nitrate with some sodium sulphate and a large quantity of wheat or rye flour.

Serial No. 11269.—Bought from Morrisson, Plummer & Co., Chicago, Ill. Price, \$2. The sample resembles in every respect No. 11255.

Serial No. 11270.—Compound extract of salyx. Purchased from Morrisson, Plummer & Co., Chicago, Ill. Price, 85 cents. The substance is used for preserving milk and butter. It is a white, homogeneous, distinctly crystalline powder, without any appreciable ash. By proper tests it was found that it was nothing but salicylic acid.

Serial No. 11665.—Gilt-edge butter compound. Obtained from the New York State dairy commissioner, who secured it from the Eureka Manufacturing Company, office, 444 Broadway; manufactory, 10 Lancaster street, Albany, N. Y. The letter of the company, accompanying the sample, was as follows:

"We send you a small sample of our butter compound (enough to make several pounds). In making tests, you need not use a pound of butter and a pint of milk as directions say, but use, say, one-quarter pound butter and one-quarter pint milk and compound in proportion. Use a quart bowl and a spoon for a churn, and the result will be the same with less expense and much easier tested. Beat the mixture, as you would beat an egg, into a froth, and if the ingredients are all of the right temperature it will come in two minutes. Follow the directions closely and you can not fail of having success."

The chemist of the New York State dairy commission, R. D. Clark, M. D., in forwarding the sample, says: "We have known that 'butter compound' has been advertised from 444 Broadway, Albany, N. Y., for several months. But as we have no jurisdiction over the compound we have paid no attention to that, except to use it as directed in order to determine the nature of the product. It is the product on the market that we want to find, which, as I stated in a previous letter, we have been unable to do as yet. * * * Mr. Talmage, a party who makes the stuff, informs me that it is composed of two parts of bicarbonate of soda and one part of sugar of milk. It originally contained chrome yellow, but that is now left out."

The sample which we received was a white powder, entirely soluble in water. A qualitative examination showed the mineral matter present to be bicarbonate of soda, with a trace of sulphate and chlorid, probably as impurities. The bicarbonate of soda is mixed with an organic substance which reduces Fehling's solution very powerfully, and by other tests is shown to be milk sugar. The sample does not coagulate milk, and therefore does not seem to contain any pepsin, rennet, or other organic ferment.

BUTTER-MAKING BY A NEW PROCESS.

An attempt was also made to obtain more definite information in regard to a new process of making butter, which is described in the following circular:

NEW PROCESS OF MAKING BUTTER FROM MILK.

The butter industry of the United States is of immense importance. In round numbers, there are from \$5,000,000 to \$15,000,000 worth sold annually in each State. In 1890 Illinois produced 95,000,000 pounds, worth about \$20,000,000; Wisconsin, 45,000,000 pounds, worth \$9,000,000; Iowa, 100,000,000 pounds, worth \$21,000,000; Minnesota, 42,000,000 pounds, worth \$8,000,000; Michigan, 40,000,000 pounds, worth \$7,500,000.

The capital of all the national (and registered) banks in 1885 was \$640,000,000, while the assessed value of the cows of the country was \$700,000,000.

It is estimated that there were 1,200,000,000 pounds of butter manufactured in the United States during 1890. The annual dairy product exceeds in value that of the lumber, wheat, and iron interests combined.

It is apparent that any improvement which materially increases the butter product must be of immense value. Recently it has been discovered that the amount of butter produced from any given quantity of milk can be more than doubled while the article so produced is of superior value. Many trials and tests have been made to determine the correctness of the inventor's claims. For accuracy, comprehensiveness, understanding, and unimpeachable veracity, none are entitled to more respect and confidence than the tests made at the State experimental farm of Minnesota by Prof. Edward D. Porter, superintendent. These tests (or trials) extended through a period of seven months, and are graphically stated by the professor, who says:

"Butter, as commonly made in the best creameries, is obtained in the maximum ratio of 4 pounds to every 100 pounds of milk, this proportion decreasing according to the quality of the milk and the manner of churning. Every 100 pounds of milk contain in round numbers 87 pounds of water, 4 pounds each of butter, casein, and sugar, and a pound of salt and other solids. By the common process of churning we get only the butter and lose the casein and sugar; in making cream cheese we get the butter and casein and lose the sugar. This new process gets all these elements, and consequently makes 12 pounds of butter where otherwise but 4 pounds are obtained.

"My scales told me that the claims of the inventor were thus far substantiated, for the work was done under my own eye. The remaining questions were as to the quality of the butter in taste and purity. I have proved the butter pure, for no chemicals are used in it other than those, such as salt and coloring matter, which are used by all creameries. My customers have, with myself, proved the taste, finding it sweet and flavored like the best of creamery butter, and Wesley Neill found it sells equally with his best brands that are stock favorites.

"I am satisfied that the new process will revolutionize the butter industry wherever a dairy is large enough to warrant its use. The process is entirely mechanical. It consists in a more perfect churning and regulation of temperature."

It should be said by way of explanation that this new process butter contains all of the muscle and fat-producing elements of milk. What mother attempts to raise an infant on butter or cheese alone?

Milk in its totality represents a complete and typical food, in which all the constituents necessary for maintaining life and growth of the body are present; while the butter element alone, *i. e.*, creamery butter, does not contain this typical food, and is in no proper sense a muscle or health builder.

This new process butter, upon the contrary, is a typical food, by reason of its containing the casein and sugar of the milk. (It is casein and sugar that gives us healthy children.) Casein is the chief proteid in milk, in its character closely related to alkali albuminates, containing also a large amount of phosphorus, on account of which it is closely allied to nucleo-albumin, being in the truest and fullest sense a nerve and muscle building food.

Thus it may be fairly said that this new process butter is of far superior value to our best creamery product. If we can get double the quantity from the same milk, and if the butter so obtained is of superior value, it may be said in all fairness that the new process is valuable.

Referring to the amount made by the States cited above, it will be seen that we add 270,000,000 pounds annually to their butter product and that, too, without the addition of a single cow. An interest so immense, an industry so honorable and valuable to the community is not often found.

Nothing calculated to restore health and build up American manhood equal in promise and extent to this new process of butter-making has occurred in the past quarter of a century.

From the Waukegan Record, Waukegan, Ill.:

"The inventor, after long and patient study and experiments, patented a new process for making butter, and has spent a week showing the practical operation of the

process on the well-known dairy farm of L. N. Brown, of Gurnee. Brown says after repeated trials of over seventy churnings he has made from 14 to 16 pounds of pure, sweet butter, equal in every respect to the best creamery, from 100 pounds of milk, while by the old process the average is about 4 pounds to the 100."

Better butter and more of it is the watchword of the day.

Prof. Porter says: "I saw the result yesterday of an analysis at the State University, and the butter was pronounced the purest they had ever seen. It will keep much longer than any other butter. It contains no cheese, but casein, from which cheese is made, is turned into butter. It is just as good and more nutritious than the best creamery butter."

Creameries can use this process without additional expense, and can use any style of churn.

Inquiries concerning this new industry should be directed to

J. D. HOLLISTER,
133 and 135 Adams street, Chicago, Ill.

Some small samples of butter were sent which were said to have been made by this process, but they reached us in such poor condition as to afford no accurate idea of the character of the product secured.

COMPOSITION OF BUTTER-MAKING COMPOUNDS.

The following are the results of the chemical examination of the samples received in so far as they have not been described above:

Serial number.	Moisture.	Ether soluble matter (mostly annatto).	Nitrogenous matter ($N \times 6.25$).	Nonnitrogenous organic matter insoluble	Ash.			Chlorin.	Common salt.	Sulphuric acid.	Calculated as sodium sulphate.
					Soluble in water.	Insoluble in water.	Total.				
11255	3.03	3.00	5.63	25.59	61.64	1.11	62.75	-----	-----	-----	-----
* 11257	-----	-----	-----	-----	57.98	1.28	59.26	-----	-----	-----	-----
11258	1.21	.97	4.88	11.96	80.37	.61	80.98	-----	-----	-----	-----
11259	2.96	3.20	5.63	25.58	61.50	1.13	62.63	36.81	60.67	.39	1.62
11260	3.18	3.17	5.79	27.55	59.10	1.21	60.31	35.62	58.72	.32	1.29
11264	3.47	3.22	5.54	26.72	59.74	1.31	61.05	36.18	59.64	.42	1.67
11267	1.87	1.38	4.47	14.51	76.96	.81	77.77	46.54	76.71	.26	.81
11269	2.95	3.17	5.78	24.72	62.07	1.31	63.38	36.35	59.93	.37	1.50

* Sample insufficient in amount for complete examination.

In regard to the starchy matters which were contained in the samples of black pepsin, they may have been added as a diluent of the annatto, or as a drying material in the manufacture of the pepsin or rennet employed in the preparation of these bodies.

Annatto was the coloring matter found in each case, except that of the pink powder mentioned. The coloring matter of the annatto is readily soluble in ether, leaving a dirty, brownish residue. The soluble ash was in each case composed of sodium chlorid, with the exception of the case of the nitrate of potash and sodium sulphate mentioned. There was also a little sodium sulphate present in most cases, and in one instance a considerable quantity of sulphate of magnesia. It is probable that these may have been accidental impurities of the common salt employed.

The property of coagulating milk was chosen as the most definite means of detecting the presence of rennet or pepsin, or other organic ferments of the digestive series, in the several preparations examined. Inasmuch as sodium chlorid and other organic salts have also the power of coagulating milk, comparative experiments were necessary to exclude this possible source of error. In the case of sodium chlorid relatively large quantities of the salt and a considerable amount of time are necessary to produce coagulation in any degree that at all resembles that produced by an organic ferment. In the execution of the experiment 5 grams of the sample were placed in a small beaker and rubbed to a homogeneous paste with 5 cc. of water. After allowing some time for the complete solution of the pepsin, 50 cc. of milk, previously warmed to 40° C., were stirred in and the beaker placed in a water bath, of which the thermometer registered 40° C., a little above blood heat. After five or ten minutes the milk was thoroughly coagulated in each case of the black pepsin compound, showing the presence of a small amount of pepsin or rennet. Milk in comparative experiments with 4 grams of sodium chlorid remained unchanged after four hours at the same temperature.

It is curious to observe that there are two distinct types of the black pepsin found, as indicated by the above analyses. Serial Nos. 11255, 11257, 11259, 11260, 11264, and 11269 evidently all belong to the same general type, as their composition is as nearly the same as could be expected, owing to the difficulty of effecting a complete mixture of the materials employed. On the other hand, serial Nos. 11258 and 11267 represent a different type, containing about 20 per cent more of organic matter than the type first mentioned. In fact, it seems to make but little difference about the type of the material employed, inasmuch as any of these preparations containing a small amount of rennet or pepsin can be used for making the imitation butter desired. Evidently, however, two distinct firms are engaged in the manufacture of the material.

The actual value of a box of the so-called black pepsin is only a few cents, and therefore the enormous profits which are made in its manufacture and sale at \$2.50 a box can be well imagined.

It is not believed that any further exposition of this barefaced fraud is necessary. We have made an attempt to obtain samples of all the various compounds which are sold for producing the effects described. There are many of them, however, which we were not able to get. Farmers can rest assured that any substance which is presented to them for the purpose of increasing the yield of butter above that of the normal belongs to some such class of fraud as has been exposed in this bulletin.

The proper way for increasing the yield of butter is to secure a breed of cows giving a milk with a high content of butter fat, giving the animals proper nourishment, and keeping them in a clean and healthy condition. The proper treatment of a herd of cows, together with neat-

ness in the dairy, not only will give an increased yield of butter, but will also enable the producer of it to get an increased price.

The best method of making a good and sweet butter in large quantity is careful selection of cows and careful feeding and care in the dairy. The proper attention to neatness and the sterilization of the vessels used about the dairy will secure the growth of a ferment which properly ripens the cream and excludes other ferments, which produce all kinds of injurious changes in the milk. All vessels used in the dairy should be subjected every day for some time to the temperature of boiling water, to absolutely exclude all putrescent bodies and fermentative processes from the dairy, save those which are necessary to the normal ripening of the cream. The farmer who attends to these details will have no occasion to invest his money in fraudulent nostrums for increasing the product of his dairy and the magnitude of his profits.

The dairy industry of the United States is already one of great importance in agriculture and is rapidly increasing in magnitude. In the Agricultural Experiment Stations of the several States investigations are in progress relating to the influence of the breeds of cows on milk and butter production. These studies extend also to the cost and effect of different feeding stuffs in their relations to the yield of milk and the percentage of butter fat therein. The advantages of deep and shallow setting of milk, the influence of temperature on the percentage of cream obtained, the profit of using centrifugal separators, and the use of the by-products of skim milk and milk sugar are all in process of investigation for the benefit and information of dairy farmers. In some States dairy schools have been established, where students are taught the science and art of dairy farming. Even if in former times there may have been some apology for the use of nostrum and humbug in milk and butter production, the advancement of knowledge on these subjects will no longer excuse it.